

What is claimed is:

1. A radiation image read-out method, comprising the steps of:

5 i) linearly irradiating stimulating rays onto an area of a stimuable phosphor sheet, on which a radiation image has been stored, with stimulating ray irradiating means, the stimulating rays causing the stimuable phosphor sheet to emit light in proportion to an amount of energy stored thereon during its exposure to radiation,

10 ii) receiving light, which is emitted by the stimuable phosphor sheet, with a line sensor comprising a plurality of photoelectric conversion devices arrayed along the linear area of the stimuable phosphor sheet exposed to the linear stimulating rays, the received light being subjected to photoelectric conversion performed by the line sensor, and  
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20 iii) moving the stimuable phosphor sheet with respect to the stimulating ray irradiating means and the line sensor and in a direction intersecting with a length direction of the linear area of the stimuable phosphor sheet exposed to the linear stimulating rays,

wherein the stimulating ray irradiating means comprises:

25 a plurality of laser diodes located such that laser beams, which have been produced by the laser diodes and act as the stimulating rays, stand in a row along the length direction of the linear area of the stimuable phosphor sheet exposed to

the linear stimulating rays, each of the laser diodes being located in an orientation such that a beam spread direction, which is normal to a junction plane, approximately coincides with the direction, along which the laser beams stand in a row, and

5           a cylindrical lens for converging each of the laser beams, which have been produced by the laser diodes, only in a plane normal to the direction, along which the laser beams stand in a row, and onto the stimuable phosphor sheet.

2. A radiation image read-out method, comprising the steps of:

10           i) linearly irradiating stimulating rays onto an area of a stimuable phosphor sheet, on which a radiation image has been stored, with stimulating ray irradiating means, the stimulating rays causing the stimuable phosphor sheet to emit  
15           light in proportion to an amount of energy stored thereon during its exposure to radiation,

          ii) receiving light, which is emitted by the stimuable phosphor sheet, with a line sensor comprising a plurality of photoelectric conversion devices arrayed along the linear area  
20           of the stimuable phosphor sheet exposed to the linear stimulating rays, the received light being subjected to photoelectric conversion performed by the line sensor, and

          iii) moving the stimuable phosphor sheet with respect to the stimulating ray irradiating means and the line sensor and  
25           in a direction intersecting with a length direction of the linear area of the stimuable phosphor sheet exposed to the linear

stimulating rays,

wherein the stimulating ray irradiating means comprises:

a plurality of laser diodes located such that laser  
5 beams, which have been produced by the laser diodes and act as  
the stimulating rays, stand in a row along the length direction  
of the linear area of the stimuable phosphor sheet exposed to  
the linear stimulating rays,

10 a cylindrical lens for converging each of the laser  
beams, which have been produced by the laser diodes, only in a  
plane normal to the direction, along which the laser beams stand  
in a row, and onto the stimuable phosphor sheet, and

optical devices, each of which is located between one  
of the laser diodes and the cylindrical lens and scatters the  
15 laser beam having been produced by the corresponding laser diode.

3. A radiation image read-out method, comprising the  
steps of:

i) linearly irradiating stimulating rays onto an area  
of a stimuable phosphor sheet, on which a radiation image has  
20 been stored, with stimulating ray irradiating means, the  
stimulating rays causing the stimuable phosphor sheet to emit  
light in proportion to an amount of energy stored thereon during  
its exposure to radiation,

25 ii) receiving light, which is emitted by the stimuable  
phosphor sheet, with a line sensor comprising a plurality of  
photoelectric conversion devices arrayed along the linear area

of the stimuable phosphor sheet exposed to the linear stimulating rays, the received light being subjected to photoelectric conversion performed by the line sensor, and

5       iii) moving the stimuable phosphor sheet with respect to the stimulating ray irradiating means and the line sensor and in a direction intersecting with a length direction of the linear area of the stimuable phosphor sheet exposed to the linear stimulating rays,

10       wherein the stimulating ray irradiating means comprises:

15       a plurality of laser diodes located such that laser beams, which have been produced by the laser diodes and act as the stimulating rays, stand in a row along the length direction of the linear area of the stimuable phosphor sheet exposed to the linear stimulating rays, each of the laser diodes being located in an orientation such that a beam spread direction, which is normal to a junction plane, approximately coincides with the direction, along which the laser beams stand in a row,

20       a cylindrical lens for converging each of the laser beams, which have been produced by the laser diodes, only in a plane normal to the direction, along which the laser beams stand in a row, and onto the stimuable phosphor sheet, and

25       optical devices, each of which is located between one of the laser diodes and the cylindrical lens and scatters the laser beam having been produced by the corresponding laser diode.

4. A method as defined in Claim 1, 2, or 3 wherein the

plurality of the laser diodes are located such that the laser beams, which have been produced by the laser diodes adjacent to each other among the plurality of the laser diodes, stand in a row so as to have an overlapping region, at which the laser beams overlap each other.

5        5. A radiation image read-out apparatus, comprising:

10        i) stimulating ray irradiating means for linearly irradiating stimulating rays onto an area of a stimuable phosphor sheet, on which a radiation image has been stored, the stimulating rays causing the stimuable phosphor sheet to emit light in proportion to an amount of energy stored thereon during its exposure to radiation,

15        ii) a line sensor, which comprises a plurality of photoelectric conversion devices arrayed along the linear area of the stimuable phosphor sheet exposed to the linear stimulating rays, and

20        iii) sub-scanning means for moving the stimuable phosphor sheet with respect to the stimulating ray irradiating means and the line sensor and in a direction intersecting with a length direction of the linear area of the stimuable phosphor sheet exposed to the linear stimulating rays,

      wherein the stimulating ray irradiating means comprises:

25        a plurality of laser diodes located such that laser beams, which have been produced by the laser diodes and act as the stimulating rays, stand in a row along the length direction

of the linear area of the stimuable phosphor sheet exposed to the linear stimulating rays, each of the laser diodes being located in an orientation such that a beam spread direction, which is normal to a junction plane, approximately coincides with the direction, along which the laser beams stand in a row, and

a cylindrical lens for converging each of the laser beams, which have been produced by the laser diodes, only in a plane normal to the direction, along which the laser beams stand in a row, and onto the stimuable phosphor sheet.

6. A radiation image read-out apparatus, comprising:

i) stimulating ray irradiating means for linearly irradiating stimulating rays onto an area of a stimuable phosphor sheet, on which a radiation image has been stored, the stimulating rays causing the stimuable phosphor sheet to emit light in proportion to an amount of energy stored thereon during its exposure to radiation,

ii) a line sensor, which comprises a plurality of photoelectric conversion devices arrayed along the linear area of the stimuable phosphor sheet exposed to the linear stimulating rays, and

iii) sub-scanning means for moving the stimuable phosphor sheet with respect to the stimulating ray irradiating means and the line sensor and in a direction intersecting with a length direction of the linear area of the stimuable phosphor sheet exposed to the linear stimulating rays,

wherein the stimulating ray irradiating means

comprises:

a plurality of laser diodes located such that laser beams, which have been produced by the laser diodes and act as the stimulating rays, stand in a row along the length direction of the linear area of the stimuable phosphor sheet exposed to the linear stimulating rays,

a cylindrical lens for converging each of the laser beams, which have been produced by the laser diodes, only in a plane normal to the direction, along which the laser beams stand in a row, and onto the stimuable phosphor sheet, and

optical devices, each of which is located between one of the laser diodes and the cylindrical lens and scatters the laser beam having been produced by the corresponding laser diode.

7. A radiation image read-out apparatus, comprising:

i) stimulating ray irradiating means for linearly irradiating stimulating rays onto an area of a stimuable phosphor sheet, on which a radiation image has been stored, the stimulating rays causing the stimuable phosphor sheet to emit light in proportion to an amount of energy stored thereon during its exposure to radiation,

ii) a line sensor, which comprises a plurality of photoelectric conversion devices arrayed along the linear area of the stimuable phosphor sheet exposed to the linear stimulating rays, and

iii) sub-scanning means for moving the stimuable phosphor sheet with respect to the stimulating ray irradiating

means and the line sensor and in a direction intersecting with a length direction of the linear area of the stimuable phosphor sheet exposed to the linear stimulating rays,

wherein the stimulating ray irradiating means  
5 comprises:

a plurality of laser diodes located such that laser beams, which have been produced by the laser diodes and act as the stimulating rays, stand in a row along the length direction of the linear area of the stimuable phosphor sheet exposed to the linear stimulating rays, each of the laser diodes being located  
10 in an orientation such that a beam spread direction, which is normal to a junction plane, approximately coincides with the direction, along which the laser beams stand in a row,

a cylindrical lens for converging each of the laser beams, which have been produced by the laser diodes, only in a plane normal to the direction, along which the laser beams stand  
15 in a row, and onto the stimuable phosphor sheet, and

optical devices, each of which is located between one of the laser diodes and the cylindrical lens and scatters the laser beam having been produced by the corresponding laser diode.  
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8. An apparatus as defined in Claim 5, 6, or 7 wherein the plurality of the laser diodes are located such that the laser beams, which have been produced by the laser diodes adjacent to each other among the plurality of the laser diodes, stand in a row so as to have an overlapping region, at which the laser beams  
25 overlap each other.



9. A radiation image read-out method, comprising the steps of:

i) linearly irradiating stimulating rays onto an area of a stimuable phosphor sheet, on which a radiation image has been stored, with stimulating ray irradiating means, the stimulating rays causing the stimuable phosphor sheet to emit light in proportion to an amount of energy stored thereon during its exposure to radiation,

ii) receiving light, which is emitted by the stimuable phosphor sheet, with a line sensor comprising a plurality of photoelectric conversion devices arrayed along the linear area of the stimuable phosphor sheet exposed to the linear stimulating rays, the received light being subjected to photoelectric conversion performed by the line sensor, and

iii) moving the stimuable phosphor sheet with respect to the stimulating ray irradiating means and the line sensor and in a direction intersecting with a length direction of the linear area of the stimuable phosphor sheet exposed to the linear stimulating rays,

wherein the stimulating ray irradiating means comprises:

a laser diode, which produces a laser beam acting as the stimulating rays, and

a cylindrical lens, which converges the laser beam with respect to one direction in order to form a linear laser beam, and which has a curvature varying over a lens longitudinal direction,

such that a beam diameter of the linear laser beam at the linear area of the stimuable phosphor sheet exposed to the linear stimulating rays becomes uniform.

10. A method as defined in Claim 9 wherein a plurality  
5 of laser diodes are located such that the laser beams, which have been produced by the laser diodes and act as the stimulating rays, stand in a row along a length direction of the linear area of the stimuable phosphor sheet exposed to the linear stimulating rays.

10 11. A method as defined in Claim 10 wherein the plurality of the laser diodes are located such that the laser beams, which have been produced by the laser diodes adjacent to each other among the plurality of the laser diodes, stand in a row so as to have an overlapping region, at which the laser beams overlap  
15 each other.

12. A radiation image read-out apparatus, comprising:

i) stimulating ray irradiating means for linearly irradiating stimulating rays onto an area of a stimuable phosphor sheet, on which a radiation image has been stored, the stimulating  
20 rays causing the stimuable phosphor sheet to emit light in proportion to an amount of energy stored thereon during its exposure to radiation,

ii) a line sensor, which comprises a plurality of photoelectric conversion devices arrayed along the linear area  
25 of the stimuable phosphor sheet exposed to the linear stimulating rays, and

iii) sub-scanning means for moving the stimuable phosphor sheet with respect to the stimulating ray irradiating means and the line sensor and in a direction intersecting with a length direction of the linear area of the stimuable phosphor sheet exposed to the linear stimulating rays,

wherein the stimulating ray irradiating means comprises:

a laser diode, which produces a laser beam acting as the stimulating rays, and

a cylindrical lens, which converges the laser beam with respect to one direction in order to form a linear laser beam, and which has a curvature varying over a lens longitudinal direction, such that a beam diameter of the linear laser beam at the linear area of the stimuable phosphor sheet exposed to the linear stimulating rays becomes uniform.

13. An apparatus as defined in Claim 12 wherein a plurality of laser diodes are located such that the laser beams, which have been produced by the laser diodes and act as the stimulating rays, stand in a row along a length direction of the linear area of the stimuable phosphor sheet exposed to the linear stimulating rays.

14. An apparatus as defined in Claim 13 wherein the plurality of the laser diodes are located such that the laser beams, which have been produced by the laser diodes adjacent to each other among the plurality of the laser diodes, stand in a row so as to have an overlapping region, at which the laser beams

